

**Florida Bay Program Management Committee Report to the  
Florida Bay Science Oversight Panel on Program Recommendations**  
(2003 Florida Bay Science Conference portion (April 14-16, 2003) of the  
Joint Conference on Greater Everglades Ecosystem Restoration)

1. General Findings of the Scientific Oversight Panel

**A. The global impact of the Florida Bay Project**

RECOMMENDATION: N/A

RESPONSE: N/A

**B. Integration beyond the synthesis document**

RECOMMENDATION 1: There has to be a continuing effort to improve and update the synthesis document. Important yet unpublished results have to be incorporated now.

RESPONSE 1: While the PMC agrees there should be a continuing effort to update the synthesis document, the existing synthesis was intended to represent the state of knowledge up to the 2003 conference only. To try and include yet unpublished results now would put a further burden on an already over tasked committee and likely prevent publication of the existing document any time in the near future. Further, while new results appearing in public forums such as the science conference may be interesting or significant, the peer-review process may reveal flaws in the methodology or data interpretation that renders the work unacceptable.

RECOMMENDATION 2: The synthesis document should be published and contain a brief synopsis of the history of major scientific conceptual models.

RESPONSE 2: The synthesis document is in the process of being published as a technical memorandum through the Florida Fish and Wildlife Commission. While future updates of the synthesis may include major conceptual models, this first publication will not.

RECOMMENDATION 3: The synthesis effort should be continued with a focus on integration between each of the central questions and linking the findings to management issues.

RESPONSE 3: The PMC agrees that integration between different topical areas is necessary. Just how to accomplish this goal will be a topic of discussion at the December 2003 PMC Planning Retreat and will likely be addressed in the next strategic plan.

RECOMMENDATION 4: The Florida Bay Conceptual Diagram should continue to be developed, even to the point of a series of nested regional diagrams.

RESPONSE 4: We agree with the necessity of distinguishing between the various subregions in Florida Bay and the utility of conceptual diagrams. Just how to accomplish this will be a topic of discussion at the December 2003 PMC Planning

Retreat.

### **C. Begin development of future scenarios**

RECOMMENDATION: Future scenarios should be developed so that research and modeling approaches can be designed to better inform managers and decisions makers of the consequences of different scenarios.

RESPONSE: Predictive tools to be used by the FBFKFS will allow for the development of future scenarios for restoration and management of the ecosystem. The impact of fill removal as well as changes in water flow are but two scenarios that will be evaluated as part of the Florida Bay/Florida Keys Feasibility Study (FBFKFS).

### **D. Enhanced modeling**

RECOMMENDATION 1: Modeling must be encouraged and, more specifically, a community-based model of physical processes should go forward as expeditiously as possible.

RESPONSE 1: The FBFKFS is pursuing a community based modeling approach for its oceanic boundary/regional hydrodynamic model

RECOMMENDATION 2: Support of the Army Corps of Engineers should be sought.

RESPONSE 2: The PMC and scientific community has always sought help from the Corps but, sometimes, the response does not fully meet the needs. The present FBFKFS plan calls for utilizing Water Quality modeling principals from WESLAB who were involved in the earlier effort.

### **E. Revision of central questions**

RECOMMENDATION: The central questions should be re-evaluated.

RESPONSE: Clearly the program has matured to a point where this is necessary and revision of the central questions will be a major focus of the December 2003 PMC Planning Retreat.

### **F. Science communication needed**

RECOMMENDATION: Scientific understanding of Florida Bay should be disseminated to a wider audience through the used of conceptual diagrams, maps, photographs, figures, etc. Theses tools could be used to augment the outreach program to the more general lay audience as well.

RESPONSE: Although the PMC as a group no longer funds Sea Grant for its outreach needs, many of the individual member agencies now support outreach activities that focus on Florida Bay and its adjacent marine systems. In addition, an interagency partnership has recently formed between several federal, state and local entities e.g., Florida Keys Aqueduct Authority, and CERP. Efforts, particularly in this explicit partnership, center on providing the lay audience a more synthetic approach regarding issues and findings versus detailed descriptions of specific research efforts.

## **G. Meso-scale experimentation recommended**

RECOMMENDATION: A suite of meso-scale (small natural basins) experiments could be conducted to test various water flow scenarios.

RESPONSE: Deliberate manipulation of the system (and addition of tracers) will not be permitted by Everglades National Park. However, substantial changes in water flow resulting from natural events e.g., tropical storms and drought, and water management structure operations provide opportunities to fortuitously test some hypotheses given adaptive event-driven sampling.

## **H. Changes in funding and management reduce the effective of NOAA research**

RECOMMENDATION: The NOAA SFP program should return to the funding level originally planned and management and decision-authority should be in the hands of regional agency managers who are best situated to understand the regional interagency process of working with CERP and SFERTF.

RESPONSE: Regional NOAA managers have conveyed this message to NOAA headquarters and have developed a specific initiative based upon this approach.

## **I. The need for continued participation by the State of Florida**

RECOMMENDATION: Significant fish and wildlife and water quality science needs remain in Florida Bay. The panel encourages FWC to find funds that focus on these information needs.

RESPONSE: *THIS NEEDS TO BE SHORTENED AND TIGHTENED UP BY JOHN.* The PMC agrees with the SOP observation that FWC and DEP should be more engaged in Florida Bay (and regional water-resource science and management, as well). The fact that the SFWMD is the principal active state organization is related to the missions of the various state agencies involved in restoration and management activities. The SFWMD is the formal “non-federal partner” in CERP. They have this assignment because it is generally appropriate from an agency mission perspective and, also, because they have their own *ad valorem* (property tax) revenue stream, some of which is specifically reserved for CERP. Florida Bay projects that have a CERP nexus still are able to be funded. There is also a general public perception that Florida Bay health is tied to water management practices, so it makes sense for them to be the lead State player at this time. FWC and FDEP have some revenue coming in from fees, but the use of that revenue is limited by statute. Trust funds that formerly supported some water management activities have been depleted during

recent lean fiscal years, and general revenue from the legislature is principally directed at land acquisition or physical construction activities associated with ecosystem restoration within the CERP framework. Without specific appropriations from the legislature, other state agencies have limited ability to allocate funds for research unless they are specifically tied to statutory authorities. FWC has responsibilities linked to and independent from CERP, particularly fisheries and wildlife management in waters adjoining ENP and Florida Bay as well as management of listed species. Through FMRI or sponsored programs, it would be appropriate for FWC to be more involved in research and monitoring of fisheries and listed species (or their habitat). FDEP, as a result of reorganizations (FMRI going to FWC) and cuts, is mostly a regulatory entity with a focus on air quality, waste management, and water quality (although most of their resource-related regulatory function has been delegated to SFWMD). They do, however, retain some in-house expertise in contaminants and monitoring as well as responsibility for managing state parks and aquatic preserves. Both agencies also have some ongoing public outreach and education functions. In the present fiscal climate, it is unlikely that additional statutory or budgetary authority will be appropriate to state agencies for research by the legislature.

**J. The impact of a reduction in the Critical Ecosystem Studies Initiative Program of DOI**

RECOMMENDATION: The continued loss of CESI funds represents a substantial threat to the success of the Florida Bay Science Program.

RESPONSE: A substantial fraction of DOI funding for Florida Bay Science Program activities has come through CESI. This funding source was always intended to be of limited duration. DOI has developed an integrated science plan to address its mandated responsibilities within South Florida Ecosystem Restoration including Florida Bay.

**K. The format of the 2003 conference**

RECOMMENDATION: Speakers at future science conferences should be more carefully selected i.e., those that have insights and conclusions vs. those that do not.

RESPONSE: The PMC agrees with the SOP that full presentations on “brand new” projects are of limited value. However, we felt that those involved with or interested in Florida Bay research should be aware of any new projects, if only to avoid duplication of

effort. In hindsight, perhaps posters should have been elicited. Another option for disseminating this information at the next conference would be to have one of the PMC co-chairs provide a brief overview of new projects. Overviews might include contact information on project PIs so interested parties could contact the PI for additional information if desired.

## 2. Questions Posed by the SOP Before the 2003 Meeting

### **A. What new findings have been made and how have these advanced our understanding of Florida Bay?**

RECOMMENDATION: Future presentations by the PMC should communicate new findings i.e., interpretive statements about advances in knowledge verses references to work to be presented.

RESPONSE: There appears to have been some misunderstanding as to what was expected of the PMC members introducing Central Question sessions at the April conference. The format of future conferences will be developed in consultation with the Standing Oversight Panel in light of the new Strategic Science Plan.

### **B. How is the program addressing resource management questions? These management issues pertain to marine sanctuaries, Everglades National Park and Everglades restoration.**

RECOMMENDATION: There is a continuing need for both day-to-day information for management of the above as well as foresight into future management issues.

RESPONSE: The PMC agrees completely. The science program needs to fulfill two basic functions: 1) to provide the essential information needed by CERP and its FBFKFS to carry out their mandates; and 2) to provide the natural resource management agencies (ENP, FKNMS, NMFS, FWC, FWS) with the information they need to responsibly respond to their mandates. A principal role of research is anticipatory, the provision of insight into future management issues

### **C. How is the synthesis process for the major scientific questions progressing since the last conference? This includes synthesis appropriate for scientific colleagues, for the interested public, and for management groups. What are the plans for enhancing synthesis such as funding for special projects, such as bringing in outside experts, or such as setting up a team to oversee synthesis? What are the gaps in understanding? How are new questions and hypotheses, especially those that fall outside the current five strategic plans being addressed?**

RECOMMENDATION 1: The PMC should consider reporting the Florida Bay Program advances in book form.

RESPONSE 1: An alternative option that has been discussed at length is to develop a special issue of an appropriate journal composed of multi-author articles by subsets of our research teams.

RECOMMENDATION 2: The next iteration of the synthesis document whether in the form of a report or book should clearly highlight advances and gaps in knowledge and be based on the latest information.

RESPONSE 2: The PMC agrees completely.

**D. What has been the impact of losing the administrative coordinator for the Florida Bay Science Program on the synthesis process and management of the program?**

RECOMMENDATION: Two vital types of communication are still missing from the program – interaction between managers and the Florida Bay program and evidence about how the public at large is being kept informed to maintain a public consensus for this work. A coordinator should be able to easily organize and manage both.

RESPONSE: The loss of the Executive Officer has had no impact on the management of the program but it has, to some degree, affected the progress of certain activities within the program. The former Executive Officer continues to be hired on a contract specific basis to assist the PMC, and ongoing staff functions essential to continued operations have been assumed by individual PMC members.

The PMC continues to integrate its members into the SFER and CERP process to foster the transfer of scientific information to restoration managers. As mentioned earlier in this report, an interagency outreach partnership has been formed to address the public at large with a focus upon how CERP may affect the coastal ocean ecosystem including Florida Bay.

**E. One topic of SOP interest is not covered by any specific question. This topic, the scientific quality of the research, includes publication in journals, applicability to management questions, appropriate use of information from the scientific literature, and evidence that the FB scientific and management lessons are being used elsewhere. As a part of this evaluation, the SOP requests that this general topic be discussed by the PMC and conclusions buttressed by a list of scientific publications to be provided before the conference.**

F. RECOMMENDATION: The SOP recommends that this general topic be discussed by the PMC and conclusions buttressed by a list of scientific publications to be provided before the conference.

RESPONSE: A list was prepared and distributed to the SOP just prior to the conference. This should have been provided earlier. The applicability of the information developed within this program in other contexts is a matter for individual investigators and agencies not the PMC. That said, we were encouraged and have since utilized the insight provided by an SOP member that SFER has global significance in addressing ecological restoration associated with a mega-city in a subtropical/tropical environment.

**G. In 2001, the PMC brought up the issue of the need to update the strategic plan (explained in the 2001 SOP Report, Findings 9, 10, and 11). What progress has been made?**

RECOMMENDATION: Although two ideas regarding the format for the updated strategic plan were mentioned, there was little discussion on the progress as a whole.

RESPONSE: While little progress has been made on the strategic plan specifically, there are other accomplishments e.g., synthesis document, that will feed directly into the revised science plan. Therefore, we felt it premature to discuss at length revision of the strategic plan until after important findings were presented at the April 2003 science conference. These findings combined with the recently completed synthesis document and the SOP Perspectives from the 2003 Florida Bay Science Conference will be used to shape the revised plan. As noted early a PMC planning retreat is scheduled for early December.

**H. Are there plans for a synthetic document that clearly presents available knowledge on the past history of Florida Bay, the knowledge gaps, and the ecological understanding of what degrees of restoration are attainable?**

RECOMMENDATION: A synthesis document on past history and future restoration would be ideal for guiding interpretation of CERP restoration targets.

RESPONSE: Though not one of the five central questions, paleoecology was included as a chapter within the synthesis document. It was also the subject of a volume published by the U.S.G.S. and a special topics PMC workshop which can be viewed at (<http://www.aoml.noaa.gov/flbay/pmcpaleo.html>)

**I. How does the PMC plan to deal with the comments and suggestions of the two recent NRC reports (from 2002 and underway for 2003)?**

RECOMMENDATION: There was little discussion on this point.

RESPONSE: Neither report was directed either the PMC or Florida Bay Science Program. Where recommendations were held to be accurate and substantive they have been incorporated into the FBFKFS implementation and into the CERP Adaptive Management strategy and implementation plan

**3. Progress in Advancing the Existing Strategic Plan for Florida Bay**

**A. Central Question #1: How and at what rate do storms, changing freshwater flows, sea level rise and local evaporation/precipitation influence circulation and salinity patterns within Florida Bay and the outflow from the Bay to adjacent waters?**

RECOMMENDATION 1: Interior basin measurements should be continued. Of specific

RESPONSE 1: A recently funded physical project is intended to systematically extend the inner basin

interest is the relationship between Whipray and one or two adjacent basins, preferably on the “downstream” side of the propagating tidal wave. Working out the details may be facilitated with judicious deployment of a few water level gauges.

RECOMMENDATION 2: Temperature-salinity surveys should be continued to provide data necessary for accurate calibration and validation of the model.

RECOMMENDATION 3: Additional current information along the western boundary would be beneficial in establishing boundary conditions.

RECOMMENDATION 4: A community modeling approach is strongly recommended. A key aspect of the community model structure is including all participants from the outset e.g., boundary condition modelers, water quality modelers.

RECOMMENDATION 5: A Model Evaluation Group (MEG) should be established.

studies in a cooperative NOAA/UM, USGS and HBOI effort. Water level gauges and acoustic current measurements are central to this effort.

RESPONSE 2: Another recently funded project continues these efforts and they have further been incorporated into the long term CERP Monitoring and Assessment (MAP) plan.

RESPONSE 3: The SOP comments emphasize improved understanding and definition of boundary conditions at the ocean interface. The PMC agrees that this is important, especially for circulation and nutrient budgets, and this is specifically included within the project described in regard to Recommendation 1. However, improving the integration of physical and hydrologic models at the Bay/wetland/upland boundary is equally important, especially for future water quality and ecological modeling that is anticipated, and for evaluating biological linkages and scenarios involving the upstream watershed.

RESPONSE 4: Model Development (Physical and Water Quality) is proceeding within the FBFKFS. An interagency modeling team (NOAA-UM<sup>1</sup>, USGS, SFWMD-UVa and USACE) is already meeting and exchanging data and model output. They are funded by the individual agencies and CERP to produce an integrated set of models to be available for scenario testing by the FBFKFS within two years. The above-mentioned team, a component within the FBFKFS, provides the requisite central organizational structure, unrelated to the new SFWMD-CE modeling center. However the products produced will ultimately be turned over to that modeling center.

RESPONSE 5: The FBFKFS is contacting individuals as to their willingness to participate in a group like the Florida Bay Program’s past MEG to

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<sup>1</sup> The NOAA model is HYCOM. MICOM (the parent of HYCOM) has now been officially accepted by GFDL and NCEP and is community-based.

oversee its modeling effort. The PMC has reiterated our opinion that this is essential to continued progress and community credibility. That said, the recommendation for technical oversight that is truly independent could be further developed and given a higher profile. The PMC and its member agencies have already expressed concern that so-called “independent review” and “expert assistance” teams or providers established within certain agencies are not really independent at all, but may be inherently conflicted by contractual obligations or partnerships with agencies.

**Central Questions #2 and #3: What is the relative importance of the influx of external nutrients and of internal nutrient cycling in determining the nutrient budget of Florida Bay? What mechanisms control the sources and sinks of the Bay’s nutrients? What regulates the onset, persistence and fate of planktonic algal blooms in Florida Bay?**

RECOMMENDATION 1: Nutrient uptake/assimilation and growth kinetics need to be combined and complemented with hydrologic and circulation modeling efforts.

RESPONSE 1: This is specifically being addressed within the FBFKFS modeling effort by the interdisciplinary modeling team mentioned earlier.

RECOMMENDATION 2: When working with isotope-labeled organic compounds, it is important that investigators use the same concentrations as are present in nature.

RESPONSE 2: Where this is technically feasible and the concentration is relevant to the process being investigated the PMC agrees.

RECOMMENDATION 3: Examinations of bloom taxa nutrient limitation, nutrient cycling and nutrient-productivity relationships should include a significant benthic component.

RESPONSE 3: The PMC agrees; the very shallow depth of the Bay results in tight coupling between benthic and water-column processes.

RECOMMENDATION 4: On the subject of microbial “lifestyles”, there needs to be far closer interaction and consultation with local experts on the physiology, ecology, trophic and biogeochemical roles and functions of *Synechococcus*.

RESPONSE 4: The PMC is not entirely clear about this; investigators such as Ed Philips have been investigating *Synechococcus* and other microbes for the past decade.

RECOMMENDATION 5: The preliminary nutrient mass balance still needs to be advanced.

RESPONSE 5: The PMC agrees, particularly with regard to nutrient fluxes across the western margin of the Bay.

RECOMMENDATION 6: Internal sources and sinks of N need to be quantified in time and

RESPONSE 6: That is the intention of the FBFKFS Water Quality modeling effort which will include

space and results incorporated in a nutrient-productivity model of Florida Bay.

RECOMMENDATION 7: N and P cycling studies should be closely coupled to seagrass and other benthic community studies.

RECOMMENDATION 8: Water column DOC and DON cycling as well as N/P/Si limitation studies should be closely coordinated and synthesized with internal nutrient cycling studies.

RECOMMENDATION 9: Internal nutrient cycling studies should be better integrated in ecosystem-level nutrient flux and budgeting efforts.

RECOMMENDATION 10: Substantial effort should be directed towards establishing the appropriate spatial and temporal scales of resolution of N<sub>2</sub> fixation and denitrification rates.

RECOMMENDATION 11: The above studies should closely couple water sediment and water column exchange as well as advective transport.

RECOMMENDATION 12: Planktonic and benthic habitats are inseparable from biogeochemical and trophic perspectives and hence should be assessed and modeled in an integrative fashion.

RECOMMENDATION 13: The SOP reiterates the need for quantifying the absolute and relative importance of internal and external physical-chemical drivers in structuring phytoplankton, microbial and higher plant communities.

RECOMMENDATION 14: Individual studies lack an ecosystem perspective and need to be well-linked to ecosystem-scale hydrologic and other forcing features.

phytoplankton and seagrass modules.

RESPONSE 7: The PMC agrees.

RESPONSE 8: DOM cycling is the focus of more than one recently funded project, the FIU LTER study and a CERP “fast-track” project funded by RECOVER.

RESPONSE 9: The PMC agrees

RESPONSE 10: The PMC agrees.

RESPONSE 11: The PMC agrees, per #3.

RESPONSE 12: The PMC agrees, per #3.

RESPONSE 13: The PMC agrees.

RESPONSE 14: The PMC agrees. This linkage (and others) can be accomplished through various means including interdisciplinary teams and workshops. The PMC will work on developing the most effective means to achieve this ecosystem perspective and linkages.

**B. Central Question #4: What are the causes and mechanisms for the observed changes in the seagrass community of Florida Bay? What is the effect of changing salinity, light, and nutrient regimes on these communities?**

RECOMMENDATION: The integration of seagrass models with the other various models that are being developed in parallel needs to be enhanced.

RESPONSE: The PMC agrees completely.

**C. Central Question #5: What is the relationship between environmental and habitat change and the recruitment, growth and survivorship of animals in Florida Bay?**

RECOMMENDATION 1: The SOP encourages expansion of research involving the role of the environment in controlling production and recruitment of HTL organisms to include further development of statistical modeling and broadening of its scope to add Principal Components Analysis and Discriminate Function Analysis.

RESPONSE 1: The SFWMD is providing funding to continue and expand statistical modeling with HTL organisms.

RECOMMENDATION 2: Long-term monitoring and fishery-independent surveys are needed to identify and monitor the status of indicator and key species.

RESPONSE 2: Presently long-term sampling is being conducted for pink shrimp juveniles and associated epibenthic fauna (USGS with CESI funding) and pink shrimp postlarvae (NOAA/USGS). Multi-year fishery-independent surveys have been conducted in the past, and have provided useful information, both singly and combined (as in the statistical analysis study), however they were discontinued for lack of funding. New funding through CERP will expand the pink shrimp/epibenthic community monitoring and also add sampling of shoreline fishes, including gray snapper

RECOMMENDATION 3: Research and modeling results reported on the American crocodile suggest that it might serve well as an indicator species in Florida Bay.

RESPONSE 3: Although the SOP uses the crocodile as an example of a non-abundant indicator, the PMC believes that further review is needed before we can concur that it would be a good indicator species. The PMC is wary of utilizing the American crocodile as an indicator species for a number of reasons: 1) they may not respond to subtle changes in environmental conditions, 2) the dogma of suitable juvenile habitat being defined by salinity structure has been challenged recently by Paul Richard's model, and 3) it is unclear what other environmental factors that will be influenced by CERP or other restoration

RECOMMENDATION 4: More research on benthic HTL species is needed.

RECOMMENDATION 5: An ecosystem perspective is needed as a framework for HTL research. Products or ecosystem-level research could include aggregative or emergent indicators of ecosystem status.

RECOMMENDATION 6: A food-web model would tie primary production to zooplankton or benthic invertebrate productivity and to higher-level consumers. It also could help determine relative productive potentials of pelagic and demersal components of the HTL species assemblages and possible shifts related to environmental or anthropogenic effects.

RECOMMENDATION 7: Risk analysis and modeling approaches could be used to evaluate proposed changes in water management.

RECOMMENDATION 8: Reformulation of Central Question #5 may be necessary to promote an ecosystem perspective.

efforts may influence crocodile habitat.

RESPONSE 4: Benthic species remain a priority, but our response is limited by funding constraints

RESPONSE 5: We agree and intend to develop an ecosystem approach concept in our new Strategic Plan.

RESPONSE 6: This will be addressed in the new Strategic Plan.

RESPONSE 7: We concur and are funding a proposal to do this work.

RESPONSE 8: We agree and our new strategic plan will be designed to orient future work toward the ecosystem approach.